Pursuit of No-till Organic Edible Dry Bean Production in Southern Idaho

Cooper Brossy
Fred Brossy

Ernie's ORGANICS

Rich Bupp

EarthKnowSys, Inc.
Professional Services for Natural Resource Projects

Jennifer Trapp

Opus Seed

U of Idaho Extension and Idaho Bean Commission's Bean School
January 2022

Ernie's Organics Background

- In operation since 1983
- Producing edible beans since late 1980s
- Certified Organic since 1996
- Concerns
  - Soil Health
    - Desire to reduce the frequency and intensity of tillage
    - Increase diversity
    - Keep a living root in the ground
  - Labor and Cost of Production

The Goal

To develop a production system with:

- A cold-season cover crop species having a maturity date early enough to be terminated with a roller crimper in late May,
- That provides a weed-suppressing mulch mat,
- That is compatible with dry beans planted via no-till methods,
- That has minimal long-term consequences for other crops in rotation,
- And that is profitable!

Roller-Crimp Cereal Rye, Plant

(Pray)

Monitor

Soil Health Testing

Success?

Swath

Thresh

Our Approach

Roller-crimp

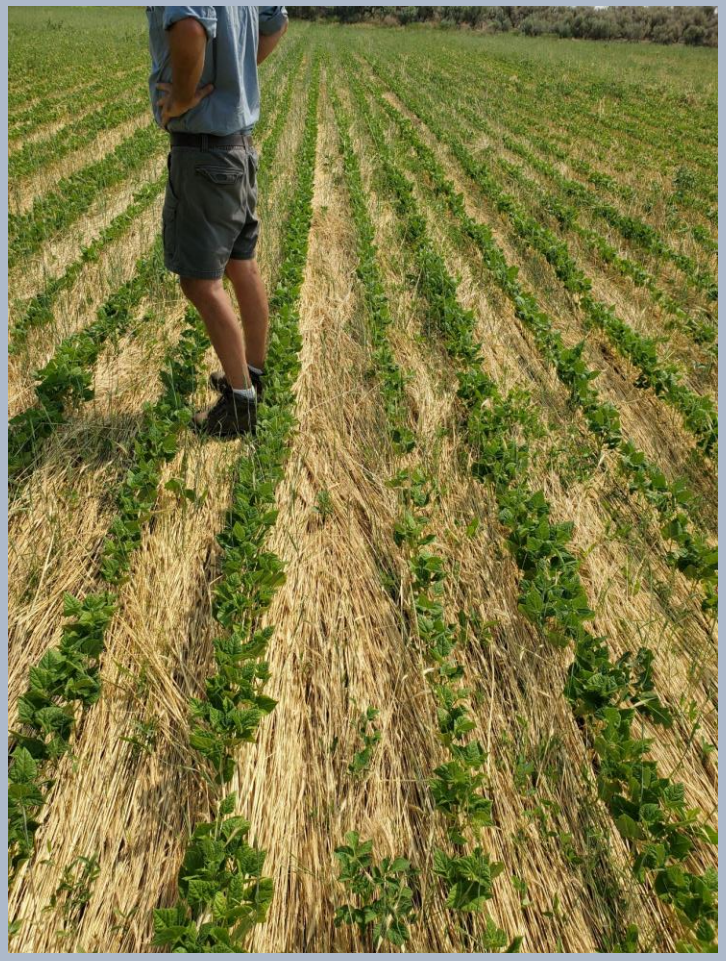
Plant

- ~100-130 lbs/acre
- ~119k plants/acre (85% germ)

Ideal Case: 145k plants/acre

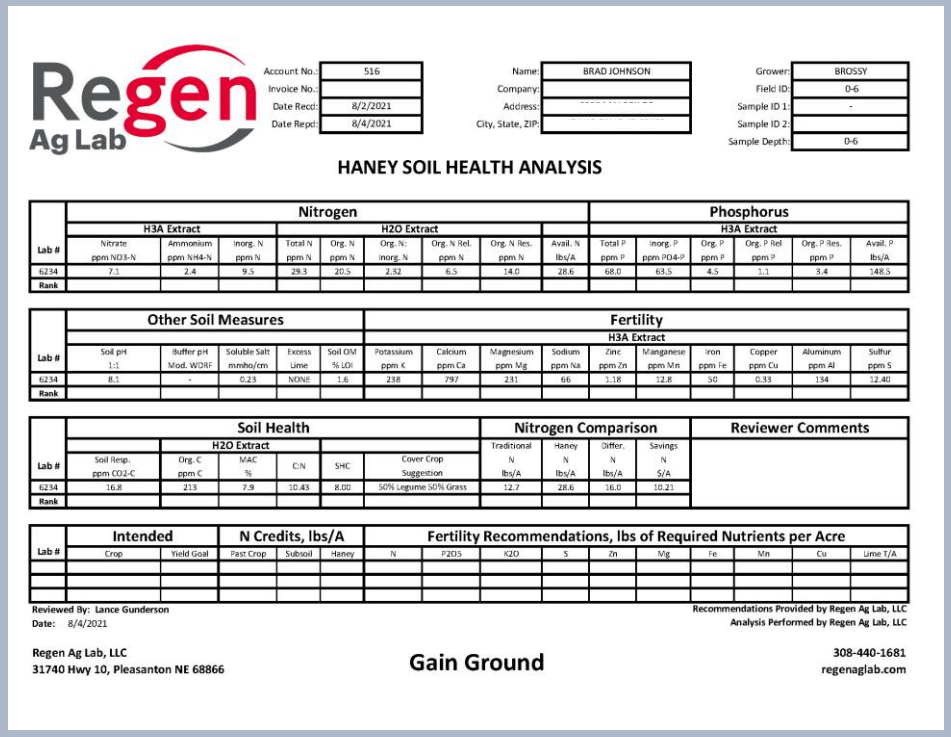
Monitor

- Soil temperatures
- Emergence



- Soil health testing
  - PFLA
  - Haney

Soil Health Testing



Regen Ag Lab

Account No.:	516	Name:	BRAD JOHNSON	Grower:	BROSSY
Invoice No.:		Company:		Field ID:	0-6
Date Recd:	8/2/2021	Address:		Sample ID 1:	-
Date Repd:	8/4/2021	City, State, ZIP:		Sample ID 2:	
				Sample Depth:	0-6

HANEY SOIL HEALTH ANALYSIS

	Nitrogen									Phosphorus					
	H3A Extract			H2O Extract						H3A Extract					
Lab #	Nitrate ppm NO3-N	Ammonium ppm NH4-N	Inorg. N ppm N	Total N ppm N	Org. N ppm N	Org. N: Inorg. N	Org. N Rel. ppm N	Org. N Res. ppm N	Avail. N lbs/A	Total P ppm P	Inorg. P ppm PO4-P	Org. P ppm P	Org. P Rel ppm P	Org. P Res. ppm P	Avail. P lbs/A
6234	7.1	2.4	9.5	29.3	20.5	2.32	6.5	14.0	28.6	68.0	63.5	4.5	1.1	3.4	148.5
Rank															

	Other Soil Measures					Fertility									
						H3A Extract									
Lab #	Soil pH 1:1	Buffer pH Mod. WDRF	Soluble Salt mmho/cm	Excess Lime	Soil OM % LOI	Potassium ppm K	Calcium ppm Ca	Magnesium ppm Mg	Sodium ppm Na	Zinc ppm Zn	Manganese ppm Mn	Iron ppm Fe	Copper ppm Cu	Aluminum ppm Al	Sulfur ppm S
6234	8.1	-	0.23	NONE	1.6	238	797	231	66	1.18	12.8	50	0.33	134	12.40
Rank															

	Soil Health					Nitrogen Comparison				Reviewer Comments
	H2O Extract									
Lab #	Soil Resp. ppm CO2-C	Org. C ppm C	MAC %	C:N	SHC	Cover Crop Suggestion	Traditional N lbs/A	Haney N lbs/A	Differ. N lbs/A	Savings N $/A	
6234	16.8	213	7.9	10.43	8.00	50% Legume 50% Grass	12.7	28.6	16.0	10.21	
Rank											

	Intended		N Credits, lbs/A			Fertility Recommendations, lbs of Required Nutrients per Acre									
Lab #	Crop	Yield Goal	Past Crop	Subsoil	Haney	N	P2O5	K2O	S	Zn	Mg	Fe	Mn	Cu	Lime T/A

Reviewed By: Lance Gunderson
Date: 8/4/2021

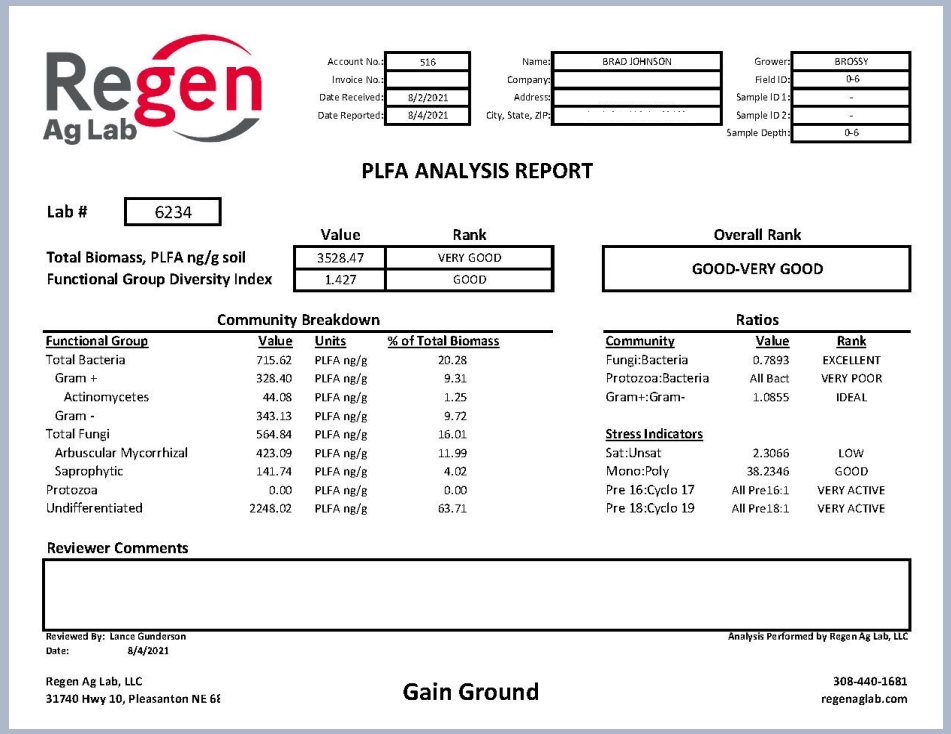
Recommendations Provided by Regen Ag Lab, LLC
Analysis Performed by Regen Ag Lab, LLC

Regen Ag Lab, LLC
31740 Hwy 10, Pleasanton NE 68866

Gain Ground

308-440-1681
regenaglab.com

How many consumable organic sugars are available to sustain soil life?



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				Sample Depth:	0-6

PLFA ANALYSIS REPORT

Lab # 6234

	Value	Rank
Total Biomass, PLFA ng/g soil	3528.47	VERY GOOD
Functional Group Diversity Index	1.427	GOOD

Overall Rank: GOOD-VERY GOOD

Community Breakdown

Functional Group	Value	Units	% of Total Biomass
Total Bacteria	715.62	PLFA ng/g	20.28
Gram +	328.40	PLFA ng/g	9.31
Actinomycetes	44.08	PLFA ng/g	1.25
Gram -	343.13	PLFA ng/g	9.72
Total Fungi	564.84	PLFA ng/g	16.01
Arbuscular Mycorrhizal	423.09	PLFA ng/g	11.99
Saprophytic	141.74	PLFA ng/g	4.02
Protozoa	0.00	PLFA ng/g	0.00
Undifferentiated	2248.02	PLFA ng/g	63.71

Ratios

Community	Value	Rank
Fungi:Bacteria	0.7893	EXCELLENT
Protozoa:Bacteria	All Bact	VERY POOR
Gram+:Gram-	1.0855	IDEAL
Stress Indicators		
Sat:Unsat	2.3066	LOW
Mono:Poly	38.2346	GOOD
Pre 16:Cyclo 17	All Pre16:1	VERY ACTIVE
Pre 18:Cyclo 19	All Pre18:1	VERY ACTIVE

Reviewer Comments

Reviewed By: Lance Gunderson
Date: 8/4/2021

Analysis Performed by Regen Ag Lab, LLC

Regen Ag Lab, LLC
31740 Hwy 10, Pleasanton NE 68

Gain Ground

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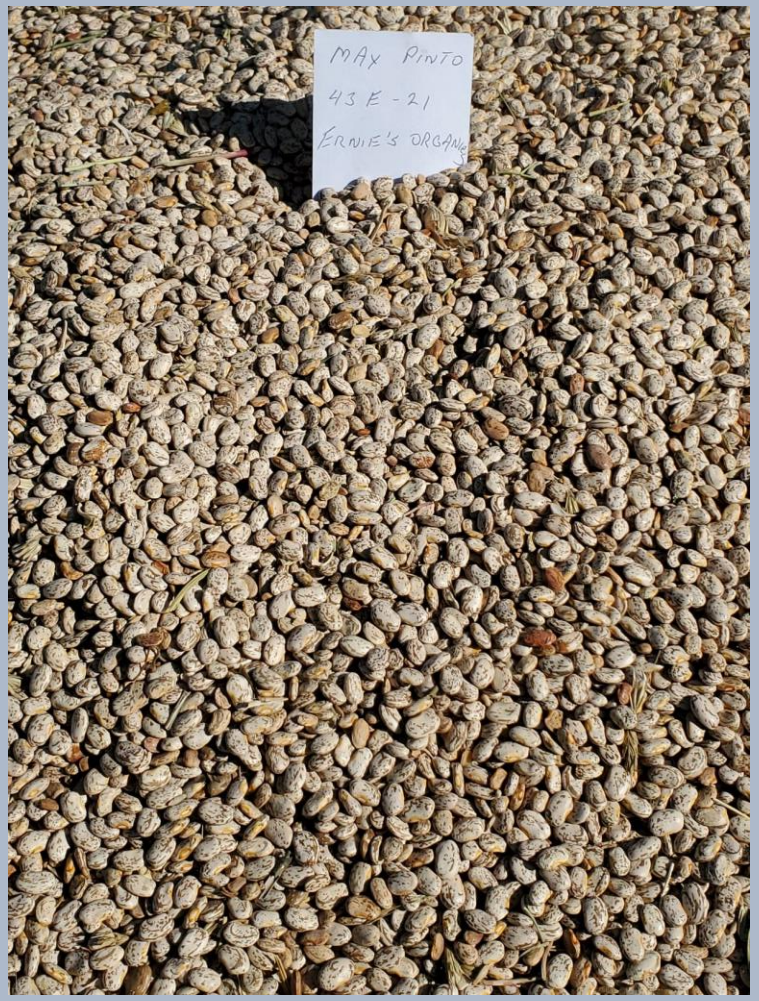
2021 Yield Results



Max Pinto

Variety	Seeding Rate (seeds/ft)	Dirt wt. yield (lbs/ac)	Clean yield (lbs/ac)
Othello Pinto	4	1356	1084
Quincy Pinto	4	1136	908
Max Pinto	4	1977	1580
Agassiz Pinto	4	1787	1429

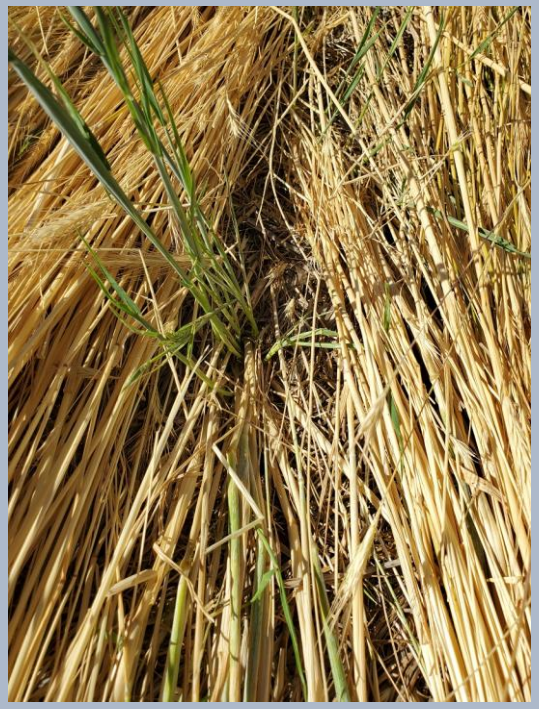
Factors affecting yield

- Late planting (June 12-14)
- Late emergence (dry soil)
- High cleanouts in all varieties from frost Sept. 3 & 4, especially Quincy

  (Frost damage = orange beans in photo)

Challenges/Questions

- Firm soil?
- Cool soil?
- Frost susceptibility?
- Rye allelopathy?
- Rye termination?



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NRC Research Press

ARTICLE

Effects of a fall rye cover crop on weeds and productivity of *Phaseolus* beans

Heather E. Flood and Martin H. Entz

Abstract: Fall-seeded rye (*Secale cereale*) is known to suppress weeds through physical and allelopathic properties. This study examined the effects of fall rye cover crops on weed and dry bean (*Phaseolus vulgaris*) productivity over four site–years in Manitoba. In addition to rye, we tested early versus late spring rye termination times as well as herbicide use in a factorial experiment with four replicates. In the absence of herbicides, rye reduced early-season broadleaf and grassy weed plant populations by 44%–72% and 43%–88%, respectively. Terminating rye at the four-leaf stage (~1100 kg dry matter ha^{-1}) provided the same level of weed suppression as termination at booting (~3100 kg dry matter ha^{-1}). Early rye termination increased bean plant populations (significant at three out of four sites), bean development (four out of four sites), bean biomass (two out of four sites), and bean yield (three out of four sites) compared with later termination. Lower bean yield with rye at one site–year was attributed to dry early season conditions, where rye reduced soil water content. While the rye cover crop provided multiple benefits to bean production, early termination resulted in the best agronomic outcome. Rye was beneficial to weed control even when herbicides were used.

Key words: integrated weed management, soil conservation, pulse crop agronomy.

Résumé : On sait que le seigle (*Secale cereale*) semé à l'automne supprime les mauvaises herbes grâce à ses propriétés physiques et allélopathiques. Les auteurs ont examiné les effets d'une culture-abri de seigle d'automne sur les adventices et sur le rendement du haricot (*Phaseolus vulgaris*) à quatre sites-années, au Manitoba. Outre le seigle, ils ont testé l'interruption de la culture au début ou à la fin du printemps, ainsi que l'usage d'un herbicide dans le cadre d'une expérience factorielle répétée quatre fois. En l'absence d'herbicide, le seigle réduit respectivement les peuplements de dicotylédones et d'herbacées nuisibles de 44 à 72 % et de 43 à 88 % en début de saison. Quand on coupe le seigle au stade de la quatrième feuille (~1100 kg de matière sèche par hectare), on obtient les mêmes résultats que lorsque la culture est interrompue à la fin de la montaison (~3100 kg de matière sèche par hectare). Comparativement à une interruption plus tardive, l'interruption précoce de la culture accroît le peuplement de haricots (de façon significative à trois sites sur quatre), le développement de la culture (tous les sites), la biomasse du haricot (deux sites sur quatre) et le rendement grainier (trois sites sur quatre). Le rendement plus faible du haricot observé une année à un site ensemencé avec du seigle a été attribué à la sécheresse qui a sévi en début de saison, le seigle ayant diminué la quantité d'eau disponible dans le sol. Bien que la culture-abri présente maints avantages pour le haricot, c'est son interruption hâtive qui engendre les meilleurs résultats du point de vue de l'agronomie. Le seigle rehausse la lutte contre les mauvaises herbes, même quand on utilise des herbicides. [Traduit par la Rédaction]

Mots-clés : lutte intégrée contre les mauvaises herbes, conservation du sol, légumineuses, agronomie.

Introduction

Southern Manitoba is Canada's most important dry bean (*Phaseolus vulgaris* L.) growing region, with over 100 000 acres produced annually. Challenges to dry bean production in Manitoba include weeds, salinity, spring soil erosion, excess water in the spring, and loss of soil quality due to rotation of beans with other low residue crops such as potato (*Solanum tuberosum*). There is a growing interest in using cover crops to address these problems.

Winter or fall rye (*Secale cereale* L.) has been tested as a cover crop in dry beans (*P. vulgaris*) (Wagner-Riddle et al. 1994; Liebman et al. 1995; Bottenberg et al. 1997;

Received 28 June 2018. Accepted 21 September 2018.

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Can. J. Plant Sci. 99: 22–33 (2019) dx.doi.org/10.1139/cjps-2018-0161

Published at www.nrcresearchpress.com/cjps on 5 October 2018.

Future Work

2022:

- Elwha winter spelt rolled CC mulch
- Trial other varieties
  - USDA Rattler pinto
  - Island pinto
  - Max pinto?
  - UC Southwest Red heirloom
- Automated soil temp data collection?

Beyond 2022:

- Trial other species for rolled CC mulch
  - Austrian winter peas
  - Other cereal rye varieties

  (ND Gardner, Spooner, Aroostook, Hazlet)
- Trial other dry bean varieties
- Develop framework for future breeding program??
- Application to conventional production systems?

Potential Funding Sources

- Western SARE Farmer/Rancher
- Organic Farming Research Foundation
- NRCS Conservation Innovation Grant?
- *Others? (What can you suggest?)*

- Currently assembling a Technical Advisory Group

Thank You!

- The Nature Conservancy for logistical and financial support
- Cheering Squad

  Jackie Jameson

  Marvin Gartner

  John Dean

  Steve Schuyler

  Marlon Winger

  Amy Mattias

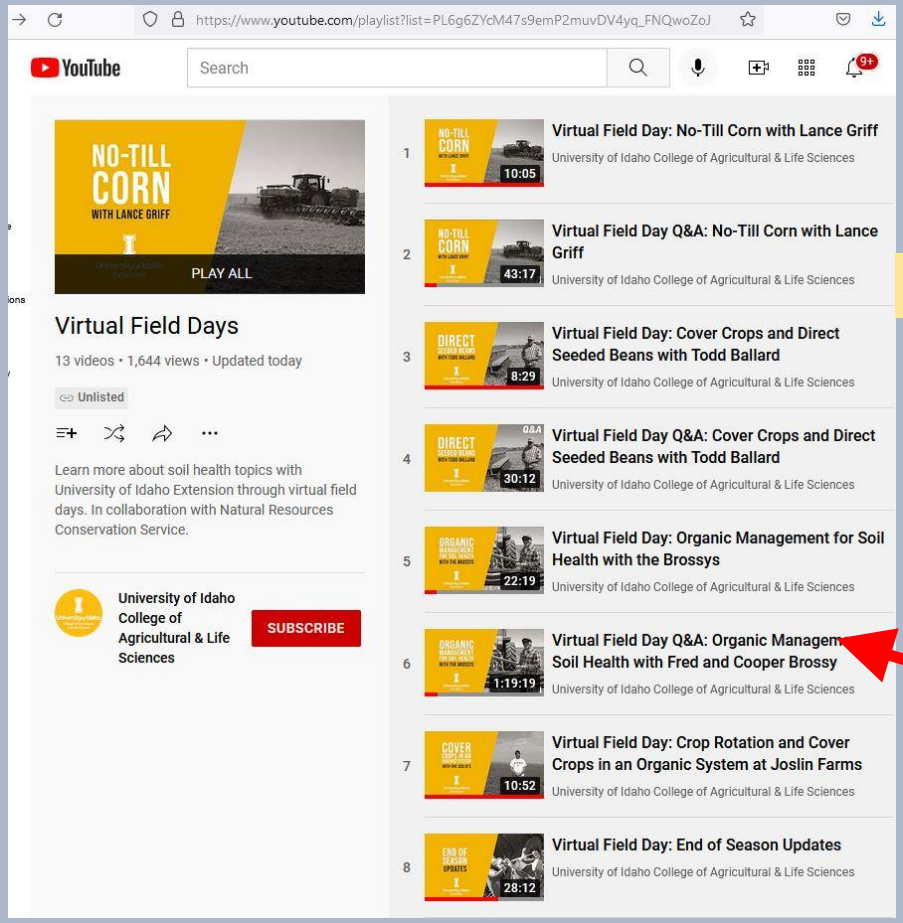
  Bill Bitzenburg

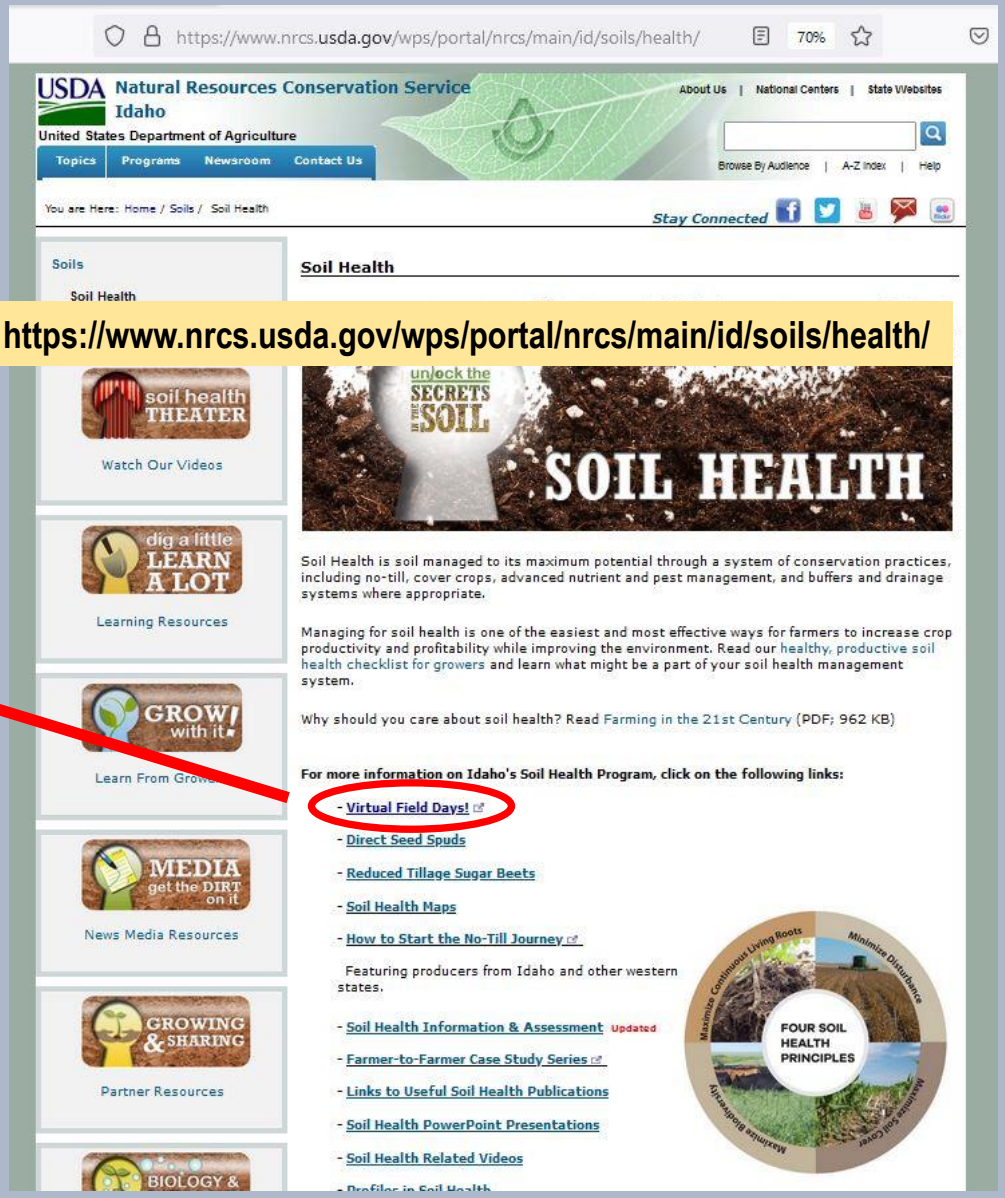
  U of Wisc—OGRAIN, Dr. Erin Silva

  Rodale Institute—Lea Vereeke

  …and others!

For more information:





Please reach out!

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